

Dietary pollinator risk assessment following use on crops only producing pollen – E.g. Potatoes



Bayer CropScience

Refined Tier 1 Potatoes

– Soil application at planting (0.2 lb ai/A)

Matrix ¹	Acute ECC (ppb) ²	Chronic EEC (ppb) ³
Pollen	188	92.6
Anthers	47.1	27.0

¹ Refers to hand collected samples

² EEC as **maximum** reported concentration among all **individual replicates** following application

³ EEC as **maximum average** concentration among all **individual sampling events** following application

Refined Tier 1 Potatoes

– Foliar appl. at BBCH 31-59 (0.05 lb ai/A)

Matrix ¹	Acute ECC (ppb) ²	Chronic EEC (ppb) ³
Pollen	116	76.1
Anthers	21.8	17.4

¹ Refers to hand collected samples

² EEC as **maximum** reported concentration among all **individual replicates** following application

³ EEC as **maximum average** concentration among all **individual sampling events** following application

Use of Toxicity Data in the RA

Description	Tox Endpoint Reported Study	Tox Endpoint used in RA	MRID#
Adult oral LD50	0.00368 µg /bee	0.00368 µg /bee	454224-26
Adult contact LD50	0.0439 µg /bee	0.0439 µg /bee	
Adult oral NOAEL	10 µg /L diet (equivalent to 0.0038 µg /bee mean intake accumulated over 10-d test period)	8.13 µg/kg diet [based on sugar density of 1.23 kg/L (EFSA, 2012b)]	484149-01
		0.00038 µg /bee/day	
Larval LD50	--	> 15000 µg /kg diet (highest concentration tested)	488768-01
Larval NOAEL	680 µg /kg diet	680 µg /kg diet	

- Chronic adult study, two endpoints possible:
 - µg/kg-diet/day – expressed in weight diet for comparison with residue data, or
 - µg /bee/day - accumulated rate divided by 10 days
- Larval study conducted according to Huang method (2009)
 - Not possible an accurate conversion from µg ai/g-diet to µg ai/bee (excess of diet provided, not 100% consumed)

Refined Tier 1 – Soil application at planting (0.2 lb ai/A)

Measurement endpoint	Caste	Effect	EEC (µg/kg)	Pollen Consumption	Exposure	Endpoint	RQ*	LOC
Honey Bees (<i>Apis mellifera</i>)								
Individual survival (adults)	Nurse bees	Acute Oral LD50	188	9.6 mg/d	1.80 ng/bee	3.68 ng/bee	0.49	0.4
		Chronic NOEC	92.6	9.6 mg/d	0.88 ng/bee/d	0.38 ng/bee/d	2.3	1
				9.98% of diet* (6.65/6.65+60)	9.24 µg/kg diet	8.13 µg/kg diet	1.13	
Brood size and success	Larva	Acute LD50	188	2.91% of diet** (3.6/3.6+120)	5.45 µg/kg diet	> 15000 µg/kg diet	<0.0004	0.4
		Chronic NOEC	92.6		2.68 µg/kg diet	680 µg/kg diet	0.0039	1

*Based on the worst-case consumption for nurse bee (cell cleaning and capping, 0-10 d): (6.65 mg pollen + 60 mg nectar)/day

**Based on the worst-case consumption for larval bee (worker larval of 4&5 d): (1.8 mg pollen + 60 mg nectar)/day or (3.6 mg pollen + 120 mg nectar)/day

Refined Tier 1 – Foliar appl. at BBCH 31-59 (0.05 lb ai/A)

Measurement endpoint	Caste	Effect	EEC (µg/kg)	Pollen Consumption	Exposure	Endpoint	RQ*	LOC
Honey Bees (<i>Apis mellifera</i>)								
Individual survival (adults)	Nurse bees	Acute Oral LD50	116	9.6 mg/d	1.11 ng/bee	3.68 ng/bee	0.30	0.4
		Chronic NOEC	76.1	9.6 mg/d	0.73 ng/bee/d	0.38 ng/bee/d	1.9	1
				9.98% of diet* (6.65/6.65+60)	7.59 µg/kg diet	8.13 µg/kg diet	0.93	
Brood size and success	Larva	Acute LD50	116	2.91% of diet** (3.6/3.6+120)	3.364 µg/kg diet	> 15000 µg/kg diet	<0.0002	0.4
		Chronic NOEC	76.1		2.21 µg/kg diet	680 µg/kg diet	0.0032	1

*Based on the worst-case consumption for nurse bee (cell cleaning and capping, 0-10 d): (6.65 mg pollen + 60 mg nectar)/day

**Based on the worst-case consumption for larval bee (worker larval of 4&5 d): (1.8 mg pollen + 60 mg nectar)/day or (3.6 mg pollen + 120 mg nectar)/day

Conclusions

Uncertainties:

- Exposure :
 - Potato crop not honeybee attractive. Sweet potato requires pollination for breeding only (small % of the total acreage) – USDA 2014
 - Crop producing pollen only, and not in all varieties
 - Difficulties to obtain potato pollen for residue analysis (in this case, anthers are not a good surrogate)
 - Maximum residue levels used as EECs
 - Effects:
 - Endpoints reported in $\mu\text{g} / \text{kg-diet}$ can be directly compared with residues in pollen
- ☐ **Dietary risk can be addressed at Tier 1 (individual bees) level with refined exposures, depending on the method used for calculation the endpoint of chronic adult study**